PROJECT NAME

LUMIN

aion
DIY GUITAR EFFECTS

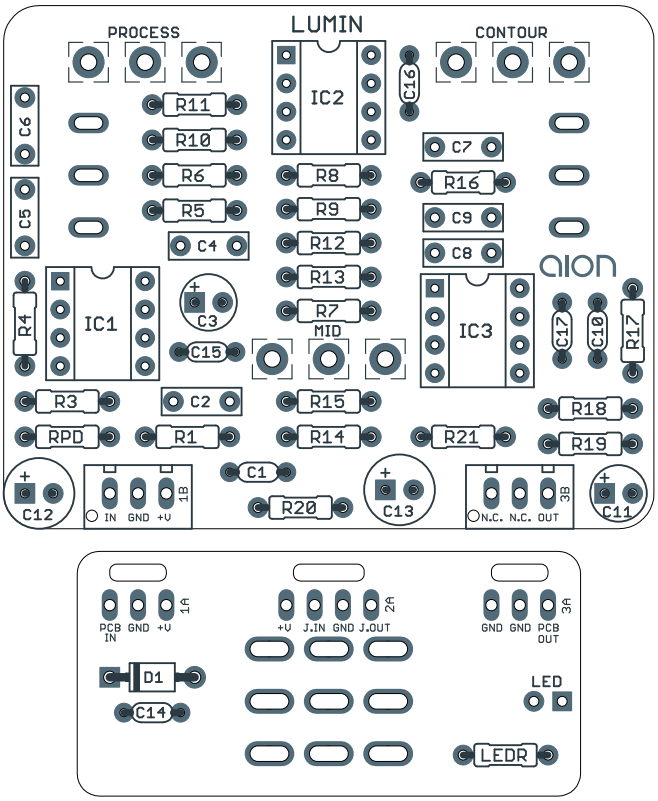
BASED ON
BBE Sonic Stomp

BUILD DIFFICULTY
Easy

EFFECT TYPE
EQ / Sonic Enhancer

DOCUMENT VERSION
1.0.0 (2019-03-03)

PROJECT SUMMARY
A unique tone-shaping tool that allows you to enhance the clarity of your signal by phase-correcting the low, mid and high frequencies separately.



Actual size is 2.3” x 1.86” (main board) and 2.3” x 0.86” (bypass board).

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INTRODUCTION

The Lumin Sonic Enhancer is a work-alike of the BBE Sonic Stomp, the single-channel stompbox version of the rackmounted Sonic Maximizer first released in the late 1980s.

The sound is often described as like taking a blanket off your speaker. It adds clarity and definition to your tone and can be adjusted to suit a wide variety of rigs and settings.

The original unit uses a proprietary analog IC manufactured by New Japan Radio that contains the core of the circuit. The Lumin is a reverse-engineered expansion of the circuit on that chip, but it should be stressed that it is not a clone, because the chip implementation is patented. A midrange knob has been added along with switches to set the frequencies of the Process and Contour knobs.

The Lumin works equally well for electric guitar, acoustic guitar, and bass guitar, but the default configuration in the parts list is best suited for electric and acoustic guitar. See the Build Notes on page 5 for details on adjusting the filters for different instruments.

The updated 125B version of the Lumin adds some additional power filtering on the ICs, but otherwise nothing has been changed from the older 1590B version.

USAGE

The Lumin has the following controls:

- **Contour** adjusts the phase response of the split signal below 50 Hz (lowpass).
- **Process** adjusts the phase response of the split signal above 10 kHz (high pass).
- **Midrange** adjusts the phase response of the split signal between 50 Hz and 10 kHz (bandpass).
- **Hi Frequency** is a switch that allows you to change the frequency at which the “Process” knob operates.
- **Low Frequency** is a switch that allows you to change the frequency at which the “Contour” knob operates.

PARTS LIST

This parts list is also available in a spreadsheet format which can be imported directly into Mouser for easy parts ordering. Mouser doesn't carry all the parts (most notably potentiometers) so the second tab lists all the non-Mouser parts as well as sources for each.

View parts list spreadsheet →

PART	VALUE	TYPE	NOTES
R1	1k	Metal film resistor, 1/4W	
R3	1M	Metal film resistor, 1/4W	
R4	1k	Metal film resistor, 1/4W	
R5	1k	Metal film resistor, 1/4W	
R6	1M	Metal film resistor, 1/4W	
R7	22k	Metal film resistor, 1/4W	
R8	22k	Metal film resistor, 1/4W	
R9	22k	Metal film resistor, 1/4W	
R10	10k	Metal film resistor, 1/4W	
R11	22k	Metal film resistor, 1/4W	
R12	22k	Metal film resistor, 1/4W	
R13	22k	Metal film resistor, 1/4W	
R14	22k	Metal film resistor, 1/4W	
R15	15k	Metal film resistor, 1/4W	
R16	10k	Metal film resistor, 1/4W	
R17	56k	Metal film resistor, 1/4W	
R18	100k	Metal film resistor, 1/4W	
R19	1k	Metal film resistor, 1/4W	
R20	47k	Metal film resistor, 1/4W	
R21	47k	Metal film resistor, 1/4W	
C1	100pF	MLCC capacitor, NP0/C0G	
C2	4n7	Film capacitor, 7.2 x 2.5mm	
C3	10uF	Electrolytic capacitor, 5mm	
C4	3n3	Film capacitor, 7.2 x 2.5mm	
C5	1n5	Film capacitor, 7.2 x 2.5mm	See build notes for details on modifications.
C6	3n3	Film capacitor, 7.2 x 2.5mm	See build notes for details on modifications.
C7	47n	Film capacitor, 7.2 x 2.5mm	
C8	22n	Film capacitor, 7.2 x 2.5mm	See build notes for details on modifications.
C9	47n	Film capacitor, 7.2 x 2.5mm	See build notes for details on modifications.
C10	100pF	MLCC capacitor, NP0/C0G	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C11	10uF	Electrolytic capacitor, 5mm	
C12	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C13	100uF	Electrolytic capacitor, 6.3mm	Reference voltage filter capacitor.
C14	100n	MLCC capacitor, X7R	Power supply filter capacitor.
C15	100n	MLCC capacitor, X7R	Power supply filter capacitor. (IC1)
C16	100n	MLCC capacitor, X7R	Power supply filter capacitor. (IC2)
C17	100n	MLCC capacitor, X7R	Power supply filter capacitor. (IC3)
D1	1N5817	Schottky diode, DO-41	
IC1	TL072	Operational amplifier, DIP8	
IC1-S	DIP-8 socket	IC socket, DIP-8	
IC2	TL072	Operational amplifier, DIP8	
IC2-S	DIP-8 socket	IC socket, DIP-8	
IC3	TL072	Operational amplifier, DIP8	
IC3-S	DIP-8 socket	IC socket, DIP-8	
CONT.	50kB	16mm right-angle PCB mount pot	
PROC.	50kB	16mm right-angle PCB mount pot	
MID	50kB	16mm right-angle PCB mount pot	
L.FREQ	SPDT cntr off	Toggle switch, SPDT on-off-on	
H.FREQ	SPDT cntr off	Toggle switch, SPDT on-off-on	
IN	1/4" stereo	1/4" phone jack, closed frame	Switchcraft 112BX or equivalent.
OUT	1/4" mono	1/4" phone jack, closed frame	Switchcraft 111X or equivalent.
DC	2.1mm	DC jack, 2.1mm panel mount	Mouser 163-4302-E or equivalent.
BATT	Battery snap	9V battery snap	Optional. Use the soft plastic type—the hard-shell type will not fit.
FSW	3PDT	Stomp switch, 3PDT	
ENC	125B	Enclosure, die-cast aluminum	Can also use a Hammond 1590N1.

BUILD NOTES

Basic theory

The legendary “BBE process” is little more than a state variable filter. The signal is split into three parts (low, medium and high) that can be controlled & modified separately before being mixed back together.

The idea is that it phase-corrects the frequencies before they are amplified and sent to the speakers and this results in optimized speaker performance.

Frequency adjustment

The stock values of the Lumin are best suited for electric & acoustic guitars. However, the circuit itself is very useful for other kinds of instruments as well. The original Sonic Maximizer is found in a wide variety of applications, including keyboards, DJ rack units, etc.

The frequency of each filter can be very easily adjusted by changing the capacitor. An R-C filter is formed via R11 and R14, both 22k resistors, so you can use a tool like the AMZ R-C Filter Calculator to find good capacitor values if you’d like to experiment. Use “22000” for the resistor value, then enter a target frequency. Based on the result, use the nearest standard value of capacitor.

Note that the switched capacitors C5/C6 and C8/C9 are in parallel with the fixed capacitors C4 and C7, so use the combined capacitance value for any calculations.

Hi Frequency switch

This sets the frequency for the Process control.

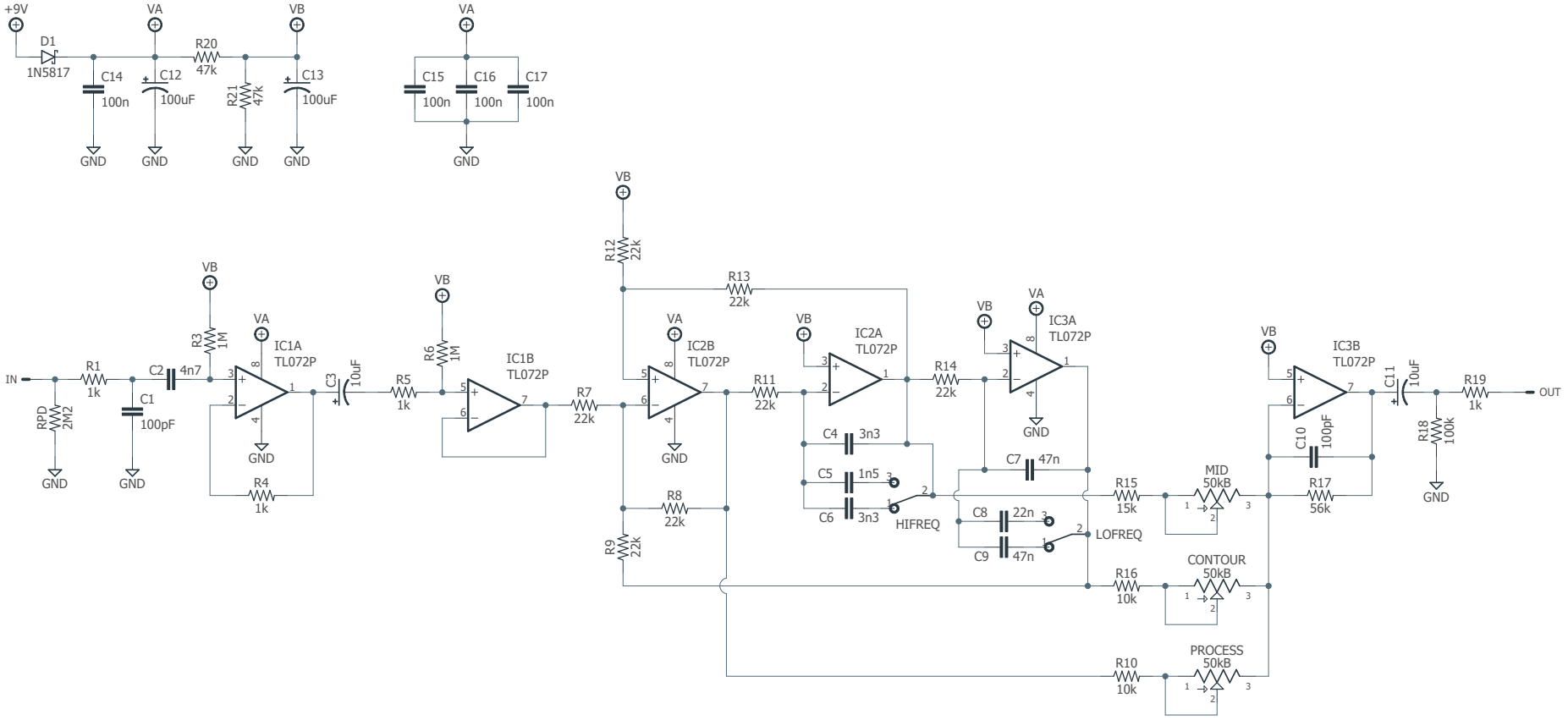
- **C4:** 3n3 (2193 Hz)
- **C5:** 1n5 (1508 Hz)
- **C6:** 3n3 (1097 Hz)

Low Frequency switch

This sets the frequency for the Contour control.

- **C7:** 47n (154 Hz)
- **C8:** 22n (105 Hz)
- **C9:** 47n (75 Hz)

SCHEMATIC


+9V
VA
VB
D1
1N5817
R20
47k
C14
100n
C12
100uF
R21
47k
C13
100uF
C15
100n
C16
100n
C17
100n
GND
IN
R1
1k
C2
4n7
C1
100pF
RPD
2M2
R3
1M
IC1A
TL072P
C3
10uF
R4
1k
R5
1k
R6
1M
IC1B
TL072P
R7
22k
R8
22k
R9
22k
R12
22k
R13
22k
IC2B
TL072P
R11
22k
IC2A
TL072P
C4
3n3
C5
1n5
C6
3n3
HIFREQ
R14
22k
IC3A
TL072P
C7
47n
C8
22n
C9
47n
LOFREQ
R15
15k
MID
50kB
R16
10k
CONTOUR
50kB
R10
10k
PROCESS
50kB
IC3B
TL072P
C10
100pF
R17
56k
C11
10uF
R18
100k
R19
1k
OUT

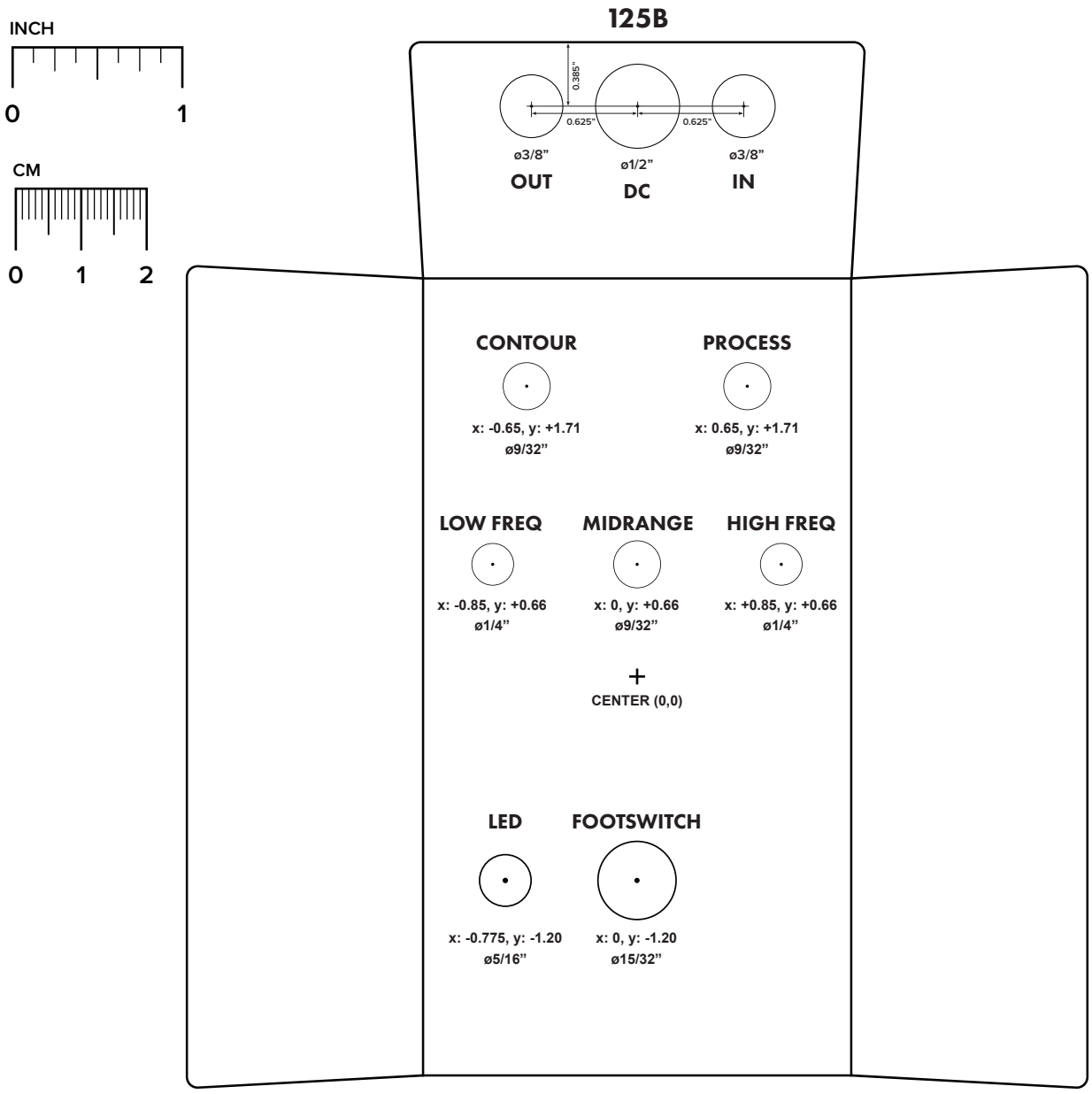
DRILL TEMPLATE

Cut out this drill template, fold the edges and tape it to the enclosure. Before drilling, it's recommended to first use a center punch for each of the holes to help guide the drill bit.

Ensure that this template is printed at 100% or "Actual Size". You can double-check this by measuring the scale on the printed page.

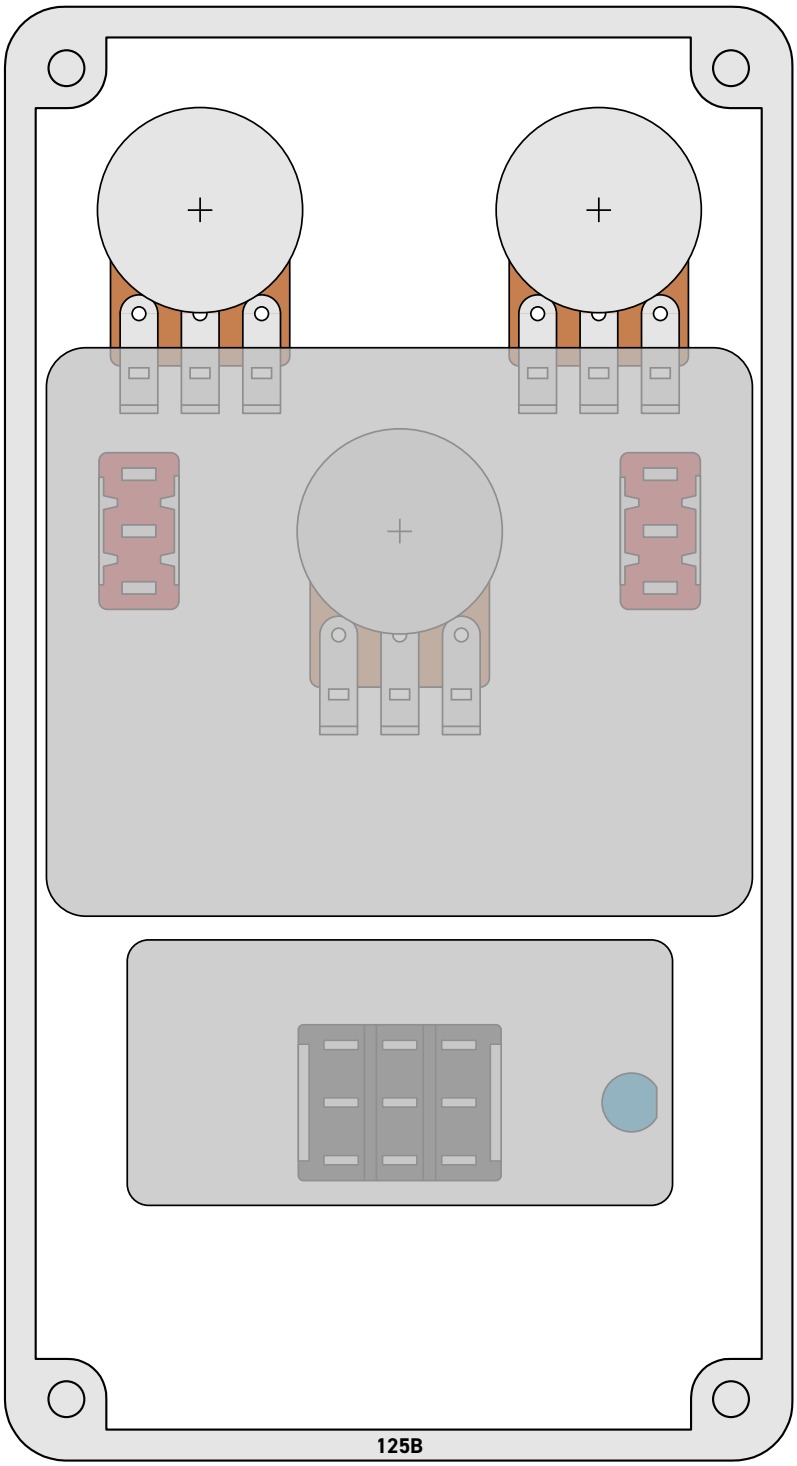
Top jack layout assumes the use of closed-frame jacks like the Switchcraft 111X. If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

LED hole drill size assumes the use of a 5mm LED bezel, available from several parts suppliers. Adjust size accordingly if using something different, such as a 3mm bezel, a plastic bezel, or just a plain LED.

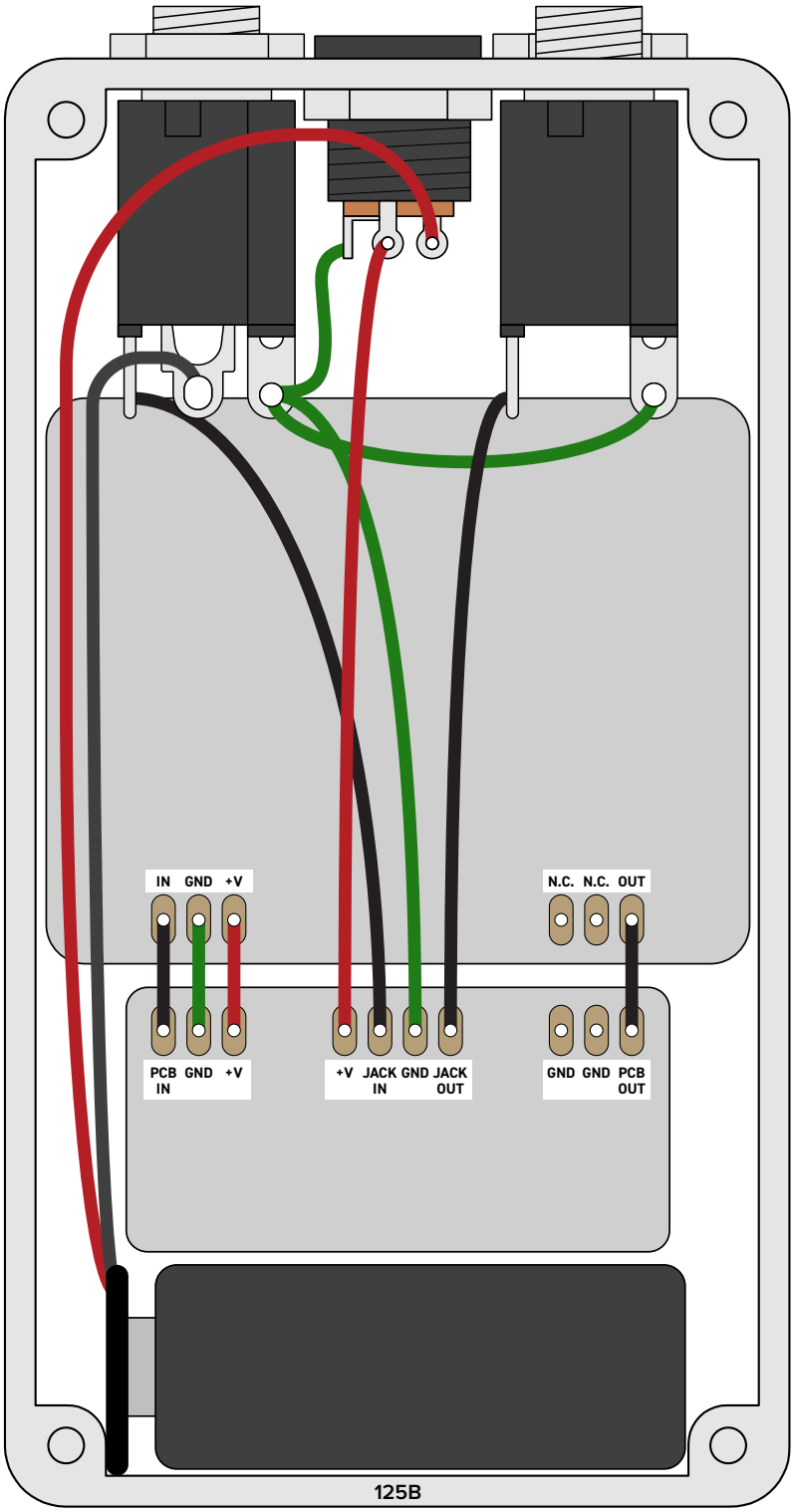


ENCLOSURE LAYOUT

Enclosure is shown without jacks. See next page for jack layout and wiring.



WIRING DIAGRAM



Shown with optional 9V battery. If battery is omitted, both jacks can be mono rather than one being stereo. Leave the far-right lug of the DC jack unconnected.

LICENSE & USAGE

No direct support is offered for these projects beyond the provided documentation. It's assumed that you have at least some experience building pedals before starting one of these. Replacements and refunds cannot be offered unless it can be shown that the circuit or documentation are in error.

All of these circuits have been tested in good faith in their base configurations. However, not all the modifications or variations have necessarily been tested. These are offered only as suggestions based on the experience and opinions of others.

Projects may be used for commercial endeavors in any quantity unless specifically noted. No attribution is necessary, though a link back is always greatly appreciated. The only usage restrictions are that **(1) you cannot resell the PCB as part of a kit without prior arrangement**, and **(2) you cannot "goop" the circuit, scratch off the screenprint, or otherwise obfuscate the circuit to disguise its source**. (In other words: you don't have to go out of your way to advertise the fact that you use these PCBs, but please don't go out of your way to hide it. The guitar effects industry needs more transparency, not less!)

DOCUMENT REVISIONS

1.0.0 (2019-03-03)
Initial release.